Creating Data-Driven Schools
By Penny Noyce, David Perda, and Rob Traver

School districts and teachers can use student data to help make decisions about school policy, curriculum, and instruction.

Many school districts underutilize one of the most powerful and common symbol systems available to them—numbers—to monitor, evaluate, and revise programs and policies. For example, in a school system committed to educating both sexes equally, no one bothers to figure out the ratio of boys to girls enrolled in advanced placement classes in science and mathematics to ensure gender equity. Or, on a larger scale, a school district that significantly increases its professional development budget makes no effort to determine quantitatively whether the extended professional development increases teacher knowledge or morale or improves student achievement.

The school district is more informed and confident about the progress and impact of program policy and methods.

Imagine instead that district decision makers pay close attention to numerical patterns to help determine how well schools are doing and what they should do next. As a result, schools recognize gender disparity, commit themselves to gender disparity, commit themselves to gender parity, and develop action plans to remedy the problem. In addition, decision makers request that the building-level administrators and teachers continue monitoring the representation and success of boys and girls in mathematics and science courses, charting the results periodically to measure policy effectiveness. When districts and schools use data to make decisions, they have the makings of a data-driven school culture.

A Data-Driven School Culture

What are the components of a data-driven school culture? What are examples from schools?

In Sound Public Schools (which has 4,500 students, 38 percent of whom are eligible for free or reduced lunch), the school district analyzed 4th grade scores from the high-stakes Massachusetts statewide exam, the Massachusetts Comprehensive Assessment System (MCAS). The district noticed that in each content area (mathematics, science, and English/language arts), writing fluency correlated strongly with overall proficiency. Specifically, the district compared the percentages of students who did not answer open-response questions, which require composing descriptions and explanations, with the percentages of multiple-choice response rates. For each of the three content areas, 35 to 45 percent of students did not even attempt to answer the open-response questions, whereas only 1 to 3 percent did not respond to the multiple-items.

This discrepancy prompted the district to examine student performance on other standardized assessments. To further diagnose student readiness for the 10th grade MCAS, Sound administered the Terra Nova exam at grade 9. An analysis of scores showed a close association between reading proficiency on the Terra Nova and subject matter knowledge as measured by the MCAS.

This close association led the school to implement performance assessments in reading and writing to students at each grade level. Teachers score the written work of students on an eight-level literacy scale, enter the information onto spreadsheets for their own analysis, and forward the data to the central office for use in the district's student database. After the reading and test trends are quantitatively documented, teachers provide extra support for students with the weakest skills.

This helps the teachers meet a crucial goal in the district improvement plan: reduce the lowest level of literacy by 25 percent each year.

Even relatively simple data patterns can suggest instructional responses. Sound's assistant superintendent reported that

> One major finding of the MCAS analysis was that many of our students were simply not familiar with the vocabulary of the assessment. For example, they didn't know that the word *sum* meant *add*. A systemwide list of necessary vocabulary has been for student assessment data that reflected the content and instructional methodology envisioned in the state curriculum frameworks.

In another series of meetings, elementary teachers met in cross-grade clusters to review school- and classroom-level reports, as well as individual student data from the MCAS. Staff then met by grade level to develop plans for revising the curriculum to improve student performance on the MCAS. Middle and high school teachers also met monthly to map strengths and weaknesses of student performance on the MCAS and Terra Nova tests against current instructional content. Teachers then completed a self-assessment survey in which they specified what they teach in their classrooms and what their perceived level of expertise is in particular subjects. The data from the survey helped the district examine the alignment of its curriculum with the demands of the MCAS, locate gaps and redundancies, plan professional development, and recommend changes for content and instructional sequence.

Halogen has turned to its increasingly sophisticated data-driven culture to examine the impact of using a commercial standards-based curriculum in mathematics. Schools within the district are at different stages of implementing the curriculum. In all schools, scores on the California Achievement Test showed significant gains in mathematical reasoning and problem solving. But the district dug more deeply into its analysis by comparing demographically similar school that were in different stages of the curriculum implementation.

One school has used the curriculum for three years; the other has only recently come on board. In the first school, 50 percent of the students were either proficient or advanced on the grade 4 MCAS, whereas 36 percent of the students at the second school were proficient or advanced. In fact, the first school outperformanced the second school in every area of mathematics, with the greatest differences in patterns and relationships, algebra/mathematical structure, and open response.

Information from the Terra Nova test supported the finding that the first school was gaining ground. Mathematical performance in the first school exceeded national averages by a substantial 16 to 17 percent in communication, geometry, number sense, problem solving, reasoning and measurement—areas of instruction frequently neglected in more traditional mathematics curriculums.

Overall, with this kind of sophisticated data, the district is prioritizing its challenged more knowledgeably, allocating its resources more efficiently, and documenting its work to all stakeholders.

Figure 1
Establishing a Data-Driven School Culture Checklist
What does the district want to know?
Where to look:
- Current district goals.
- Patterns in data.
- Upcoming district decisions.
- Questions raised by teachers, administrators, or the community.

How will the district find out?
What to do:

- Form data team.
- Conduct inventory of data currently compiled in the district and determine format (electronic or paper).
- Assess technological capacity of the district to manage and analyze data.
- Determine the extent to which personnel in the district have time, skills, and willingness to engage in data-driven projects.
- Identify indicators of input, process, and outcome variables related to goals.
- Determine which additional data are reasonable to collect.
- Train staff to collect and use data.
- Analyze and disaggregate data.

What does the district do next?

How to proceed:

- Establish benchmarks and measure progress toward goals over time.
- Develop action or school improvement plans.
- Communicate findings.

Promoting Data-Driven Cultures

Data-driven school cultures do not arise in a vacuum. They need a major motivator and technical and financial support. In Massachusetts, much of this has come from the Department of Education. The MCAS has riveted the attention of school districts because it is a high-stakes exam, it reports results at classroom and student levels, and it requires student-composed answers to its open-response and essay questions. Before the exam was mandated, student-composes answers were not a common instructional focus in Massachusetts schools.

To date, the Partnerships Advancing the Learning of Mathematics and Science (PALMS) project, a National Science Foundation state systemic initiative, has been a major provider of funds and advice for setting up data-driven cultures. Grants to 26 school districts, including Sound, Halogen, and Unified (described below), range from $4,500 to $65,000. Although focused on mathematics, science, technology, and engineering, PLAMS support extends to all areas of the curriculum and to the data-driven needs of both the district and the teacher.

No One Right Way

In brief, PALMS finds that data-driven school cultures take hold in one of two ways. In larger school districts, data-driven efforts reside within institutional research and development units. In small districts, data-driven efforts usually begin with the work of one person who has a quantitative bent, enough teachers for the different assessments.

At the building level, the information system produces reports with real-time data. This is extremely important to administrators, who regularly deal with student movement among buildings. The district ensures the requisite building-level expertise by training at least one individual in each school. This approach is powerful because it puts information analysis directly in the hands of those most responsible for making and effecting decisions. This strategy also frees up time for more complex analyses by the two data specialists who are employed districtwide. The fact that Unified is the highest scoring urban district in the state may be due, in part, to its growing data-driven culture.

Future Successes

More than anything else, a data-driven school culture means that the district solely uses quantitative patterns to make decisions, especially those related to programs, curriculum and instruction, and resource allocation. Administrators, faculty, and other key stakeholders support

this work by allocating resources to establish and maintain a data collection system and by training personnel who are as close to the classroom as possible. Typically, data teams carry out special projects related to a larger data system and to districtwide goals. Any district can expect gains in student achievement over time when it becomes data-driven.

Authors' note: School district names are pseudonyms.

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